TVUPack Mini™ *SE*

Set Up and Operating Guide
Model TVUPack Mini™ SE – TM5100

Version 4.0

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Federal Communications Commission (FCC) Regulation of ENG Mobile Systems
The FCC provides specific policies and procedures related to radio frequency (RF) emissions in mobile and portable devices. The FCC outlines test requirements and specific test procedures based on the type of device. These test requirements and procedures can also cover Specific Absorption Rates (SAR) for RF.

The TVUPack device has always conformed to all applicable FCC regulations covering mobile systems for electronic news gathering. All required tests for the TVUPack device as outlined in the regulations were performed by a third party testing lab which issued a certificate of compliance for the TVUPack. The certificate is applicable to both the FCC and CE. Additionally, the data modems used in TVUPack are commercially available off-the-shelf brands and have been FCC and carrier certified.

Supporting documentation demonstrating TVUPack's compliance with the applicable FCC regulations is available upon request. Please contact us at +1.650.969.6732 for assistance and questions regarding approved modem cards for use with TVUPack.

INTRODUCTION

Designed specifically for Sony XDCAM camcorders, the TVUPack Mini SE TM5100 is a small, lightweight video transmission solution that uses multiple 3G/4G/LTE, Wi-Fi, Wi-Max and Ethernet connections to capture and transmit live broadcast quality SD or HD video.

This model's untethered, integrated design fits on the back of supported Sony cameras to capture and broadcast live professional-quality content on air or direct-to-Web. The TVUPack Mini SE mounts between the Sony XDCAM shoulder camcorders and the battery system via the standard V-mount and does not require additional external cables to operate.

ABOUT THIS GUIDE

This operational guide provides instruction for setting up the unit and a brief overview of the available components for this model (TVUPack Mini SE).

Read and follow the simple instructions contained in this guide to setup your new TVUPack Mini SE

TVUPACK MINI SE TRANSMITTER COMPONENTS

Standard components for the TVUPack Mini SE include:
- ✓ TVUPack Mini SE TM5100 Camera Mount Transmitter
- ✓ Power Supply (AC Adaptor) – 4-pin XLR
- ✓ Hotspot Adapter (system setting web interface only)
- ✓ Wi-Fi Adapter
- ✓ USB to Ethernet Adapter
- ✓ Operating Guide and User Manual

Optional components for the TVUPack Mini SE include:
- • V-Mount Battery (Phylion)
- • Battery Charger
- • IFB Function
- • Data Cards
- • iPod
- • Universal Adaptor

Note: If any component is missing, please contact TVU Networks Customer Support at support@tvupack.com or +1.650.440.4812.

TVUPack Mini SE (50-pin) Transmitter (Front Panel)

Figure 1 - Mini SE (50-pin) Front Panel

Label	Connection	Mini SE 50-pin Front Panel Description
A	**Mount Screw**	Camera accessory mount thumb screw
B	**Color LCD Screen (Video Input Preview and Status Info)**	– Input Preview: Displays input preview (when a valid input is connected). When not connected, color bars are displayed. – LIVE icon: When TVU Pack is Live, this displays – Battery / AC Icon: Displays battery charge level on a graphical display (when running exclusively on battery) or displays an AC input symbol (when running via the AC adapter). – VBR: Displays the current Variable Bit Rate of the transmission. – R: Displays the connected Receiver. – When not LIVE, the display shows the connected IP of Ethernet (when connected, when not connected, displays 0.0.0.0) as well as the PID of the Mini SE unit.
C	**Power Button**	Press Power Button to turn-on device. Press and hold for 3 seconds to power off. A message will display on the LCD that the unit is powering off.
D	**Power Indicator**	Green when On
E	**Signal Indicator**	Displays overall signal strength based on R bit-rate/latency settings. Would alert to significant signal drop-off. **LEDs:** – Good - Green – Caution –Yellow – No Signal - Red
F	**USB Connections**	Connection 1-6. Slot 1 is for Hotspot and Slot 2 is for Wifi (or alternatively USB-Ethernet dongles or data cards) and slots 3-6 are all data cards. Note: The Hotspot port is unique and you cannot connect a data card to a

Label	Connection	Mini SE 50-pin Front Panel Description
		Hotspot port.
G	Headphone Jack	IFB Headphone Jack
H	50-pin Interface	50-pin interface (connection to Sony camera). Includes HD-SDI input and serial control. This interface has priority over the standard BNC input.

Table 1 – Mini SE Front Panel connections

TVUPack Mini SE (50-pin) Transmitter (Rear Panel)
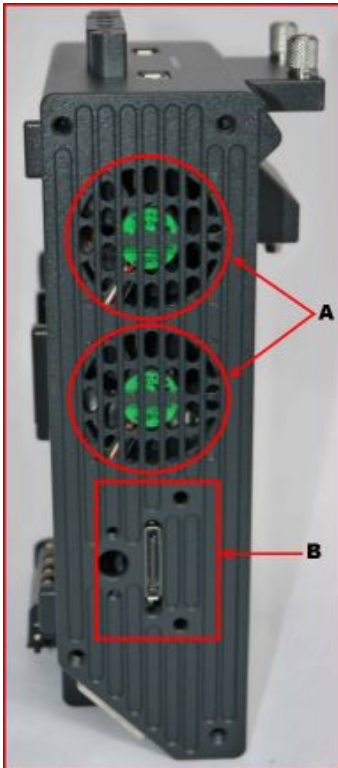
Figure 2 - Mini SE (50-pin) Rear Panel

Label	Connection	Mini SE (50-pin) Rear Panel Description
A	Cooling Fans	2 Cooling Fans (Do not block)
B	Multipin USB Connector	Custom Multipin USB Interface for connecting the TVUPack Mini SE modem enclosure.

Table 2 – Mini SE Rear Panel connections

USB Connections
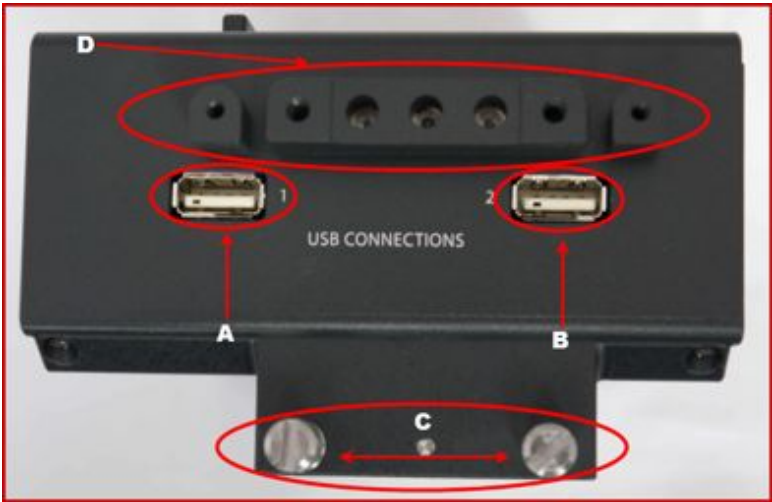
Figure 3 - Mini SE (50-pin) Rear Panel

Label	Connection	Mini SE (50-pin) USB Connection Description
A	**Port 1**	For connection of HotSpot adapter
B	**Port 2**	For connection of Wifi adapter or USB to Ethernet Adapter
C	**Thumbscrews**	Camera accessory thumb screw mount
D	**Accessory mount points**	Additional mount points (Sony Style)

Table 3 – Mini SE USB connections

Bottom Panel

Figure 4 - Mini SE (50-pin) Bottom Panel

Label	Connection	Mini SE (50-pin) Bottom Panel Description
A	DC Input	DC Input (4-pin XLR) 11-19V
B	SD/HD-SDI Input	Secondary SD/HD-SDI input (BNC). Note: SDI via 50-pin has priority.
C	Vent	Air intake venting (Do not block)

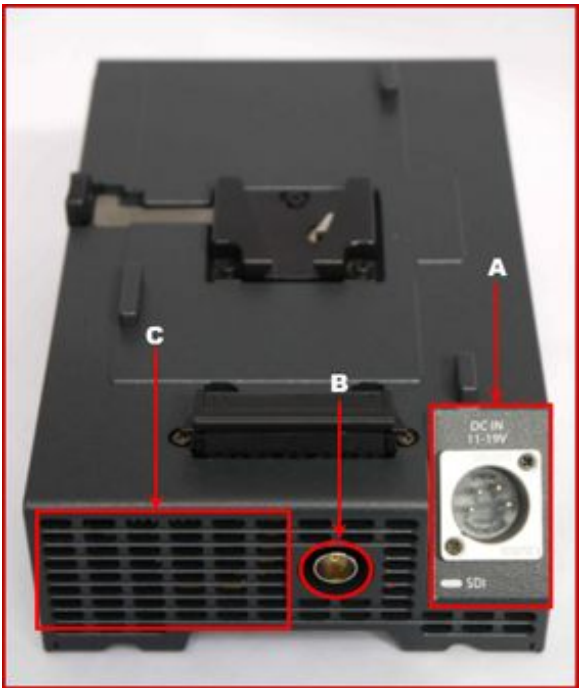**Table 4 –** Mini SE Bottom Panel connections

Camcorder Mount Side – 50-pin
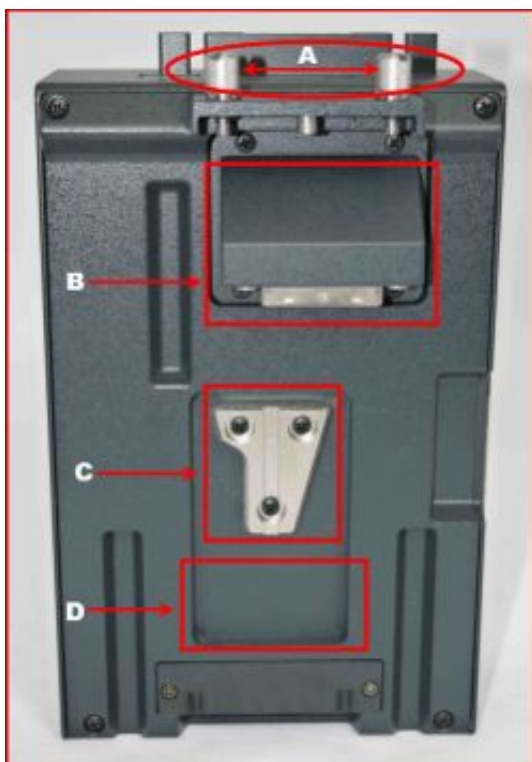
Figure 5 - Surface mount to rear of V-Mount

Label	Connection	Mini SE (50-pin) Bottom Panel Description
A	Accessory Mount	Camera accessory mount thumb screws
B	Interface	50-pin interface (connection to Sony camera). Includes SD/HD-SDI input and serial control
C	V-Mount	V Mount Camera Interface
D	Power interface	Camera Power Interface

Table 5 – Rear V-Mount connections

Camcorder Mount Side – V-mount Option

This mounting option is ideal for camcorders that can accommodate V-mount attachments.
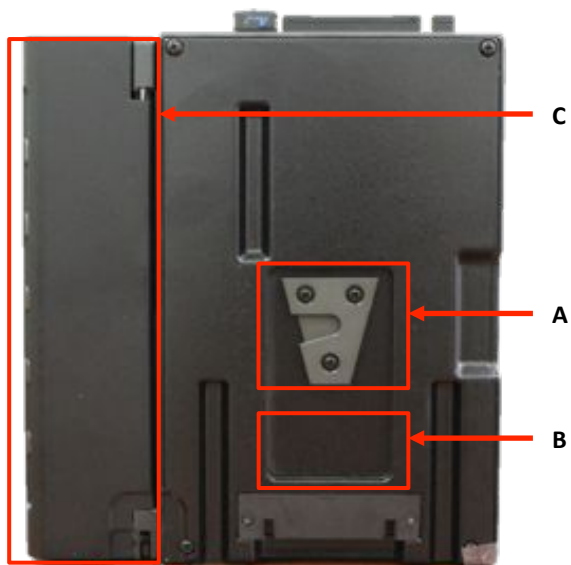
Label	Connection	Mini SE (V-mount) Camera Side Mount Description
A	V-Mount	V Mount Camera Interface; To release the TVUPack Mini SE from the camera, press the release button on the camera
B	Modem Module	Module that holds cellular modems
C	Power interface	Camera Power Interface

Battery Mount Side
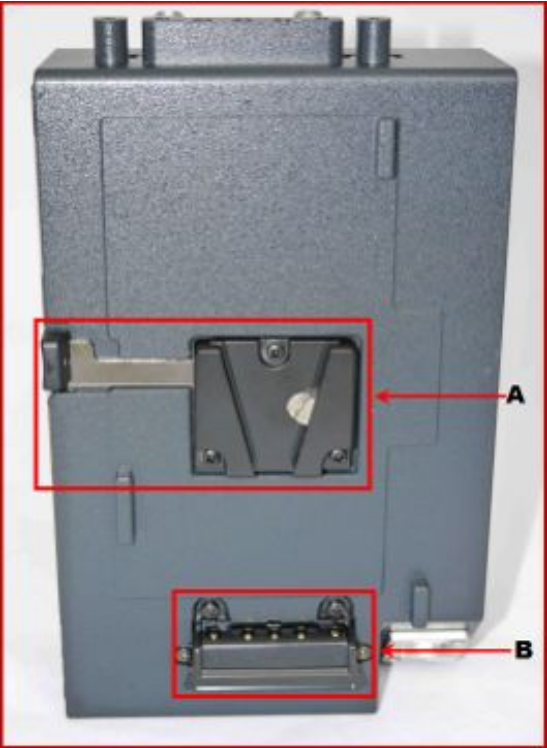
Figure 6 - Battery Mount Side

Label	Connection	Mini SE (50-pin) Bottom Panel Description
A	**Interface/Release**	V-Mount Battery Interface and Release
B	**Battery Interface**	V-Mount Battery Terminal Interface

Table 6 – Rear V-Mount connections

Mounting Mini SE (50-pin) to a camera

The TVUPack Mini SE 50-pin is designed to mount to Sony PMW-320/-350/-400/-500 and PDW-680/-700/-F800 camcorders. For the PMW series camcorders, the 50-pin option must be installed on the camera in order to use the 50-pin interface.

Note: The 50-pin interface on Sony Camcorder's supports HD output only. For SD output, set the camera's Ext SDI output to SD mode and connect a BNC cable between the camera's SDI output and the Mini SE's SDI input.

Mini SE Mount Instructions

In order to mount Mini SE to compatible PMW/PDW camcorders, you must first install the 50-pin option on the rear plate of the camcorder.

Figure 7 - 50-pin option installed

Securely mount the Mini SE to the back of the camcorder ensuring the 50-pin adapter and V-Lock properly connects to the unit.

Figure 8 - Mount to camcorder

Tighten the camera accessory screws on the Mini SE so that the unit securely mounts to the camcorder.

Figure 9 – Tighten thumb screws

Modem Enclosures

Configuring Modems on Mini SE

The Mini SE is designed for use with the Full Size Modem Enclosure that holds up to four LTE/3G USB modems. This enclosure is removable, allowing the device to operate in stand-alone configuration, or for swapping between modem enclosures. The modem enclosure is described in more detail below:

Full Size Modem Enclosure

The full-size modem enclosure ships as a single component and consists of an aluminum base plate and a hinged modem cover. The enclosure itself mounts to the rear-panel of the Mini SE unit.
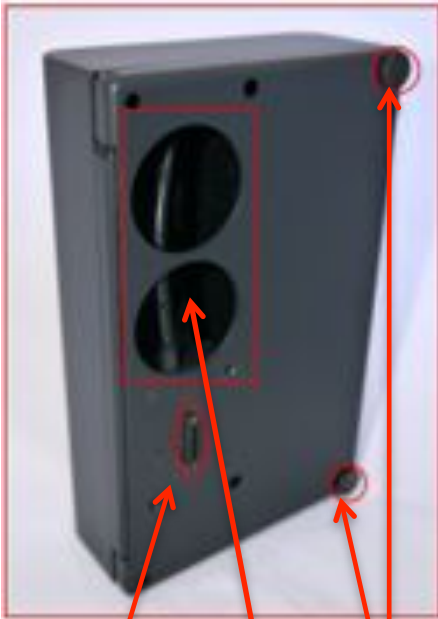
Figure 10 - Closed Full Size Modem Enclosure   **Figure 11 –** Open Full Size Modem Enclosure

Thumb screws

Multipin interface

Fan pass through holes

Back plate

Modem Enclosure Cover

USB Modem Extension Cables (x 4)

Mount the full-size modem enclosure to the rear side of the Mini SE unit. In order to mount the enclosure, you will need to open the cover. To do this, undo the two thumb-screws on the outside of the modem module. There are four mount screws to secure it to Mini SE. Align the back plate of the Full-Size Modem Enclosure with the four mount points on the rear side of the Mini SE enclosure. You will need to align the multipin in-terface with the corresponding socket on the Mini SE. Carefully press the back plate down with the multipin interface inserting to the corresponding socket. The multipin Interface will attach firmly to the side of the unit. Be careful not to damage the con-nector. Insert and tighten the provided screws in the positions described in figure 12.

Four mount holes corre-spond to mount points on Mini

USB Modems Connected USB Extension Cables

Multi-pin inter-face

Full-Size Modem Enclosur
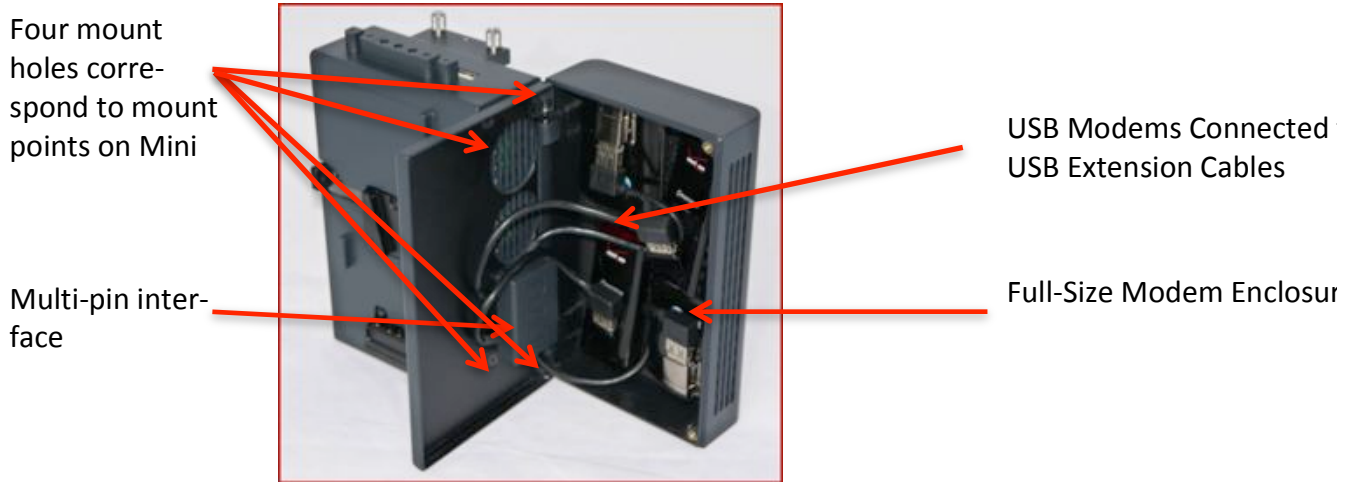
Figure 12 – Mounting steps

Once mounted, insert up to four LTE/3G modems into the Full Size Modem module cov-er. Use Velcro to set the modems in place on the inside of the modem module cover. Do not stack modems. Connect the USB extension cables to each of the modems. Be careful not to pinch any of the USB extension cables when closing the cover.
Once connected, close the Modem Module cover and secure with the thumb screws.

Figure 13 – Mounted module cover

When the modem enclosure is connected, mount Mini SE 50-pin to a camera as described earlier. Connect a V-Mount battery or the supplied 4-pin XLR AC adapter to the rear of the Mini SE prior to use.

Figure 14 Connect battery or 4-pin adapter to Mini SE

Camcorder Viewfinder Status

When used with a Sony PMW series camcorder and the Mini SE is connected to the 50-pin interface on the camcorder, it is possible to view transmission status in the camcorder's electronic viewfinder (EVF). When Mini SE is in LIVE transmission mode, the following Green icon will appear in the EVF. When not live, this area will be blank.
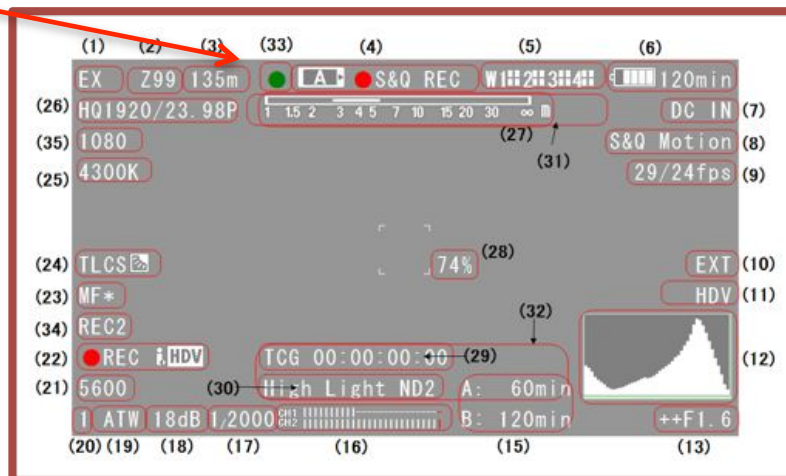
Mini SE Transmission Status Indicator

Figure 15 Transmission Status Indicator

USB Data Modems

The TVUPack Mini SE supports 3G and 4G wireless cellular data cards. If you did not lease your data cards from TVU Networks, make sure that the cards you acquire are compatible with Linux and obtain the dial number, username, password and APN if applicable from the provider. For the latest supported data cards or for any other assistance with data card installation, contact Customer Support at support@tvupack.com or +1.650.440.4812.

You may purchase cards from any mobile network provider. To ensure network diversity, we recommend you purchase at least three data cards from a minimum of two different mobile network providers. For example, your three data cards can be comprised of one AT&T, one Verizon and one T-Mobile or two AT&T and one Verizon. Figure 16 contains two examples of compatible data cards.

Figure 16 – Data card examples

International Customer Notice:

In countries where 3G modems use removable SIM cards, TVU Networks currently supports these modems: Huawei E369 and E261. If the operators in your country provide other modem types, contact us about compatibility with the TVUPack Mini.

TVUPack Mini Configuration and Monitor Interface

TVUPack Mini configuration and monitoring are handled via a web interface. This interface can be accessed using a standard web browser connected to the Mini SE's HotSpot, and is compatible with the following web browsers:

- **Safari** – MAC
- **Internet Explorer** – Windows

Connecting to the Hotspot

It is generally expected that a Hotspot dongle is always connected to the pack and always available.

1) HotSpot should always be inserted into USB Port 1 on the top of Mini SE.
2) The Hotspot broadcast SSID is "TVUPACK MINI_XXXX" where XXXX is the last four digits of the Mini PID. The SSID security is WPA2 and the password is the last eight digits of the PID (all uppercase).

3) Once connected to the Hotspot, go to http://192.168.3.1 to access the Pack monitor/control screen interface.

Web Menu Selection Tabs

From a web browser, the TVU Transmitter status can be monitored and various parts of the transmission can be controlled. This interface can be accessed using a standard web browser connected to the TVUPack's Hotspot. See *Connecting to the Hotspot (page 15)* for details on how to connect to the Hotspot.

Note: The images below are examples of how the screen would appear on an iPhone web browser

TVUPack Transmitter Status Screen
The Status tab provides system information.
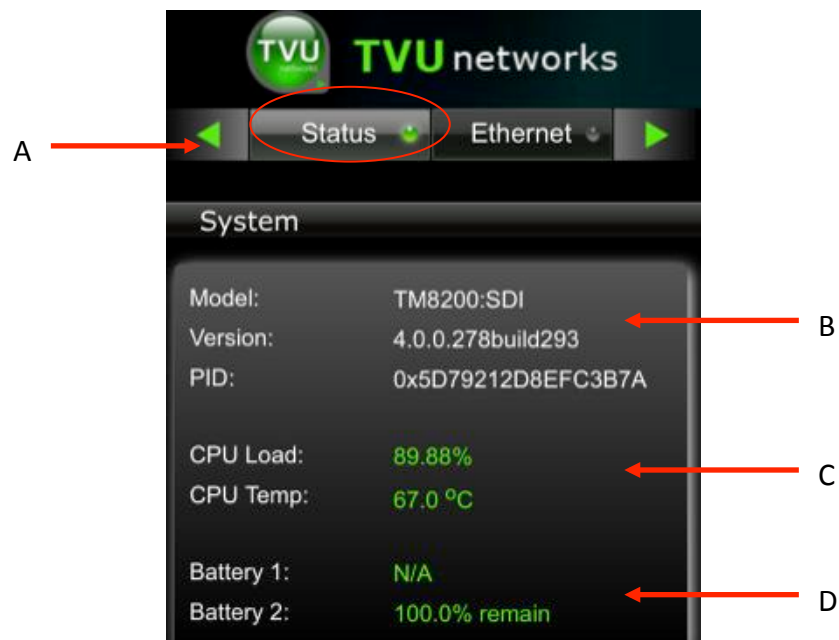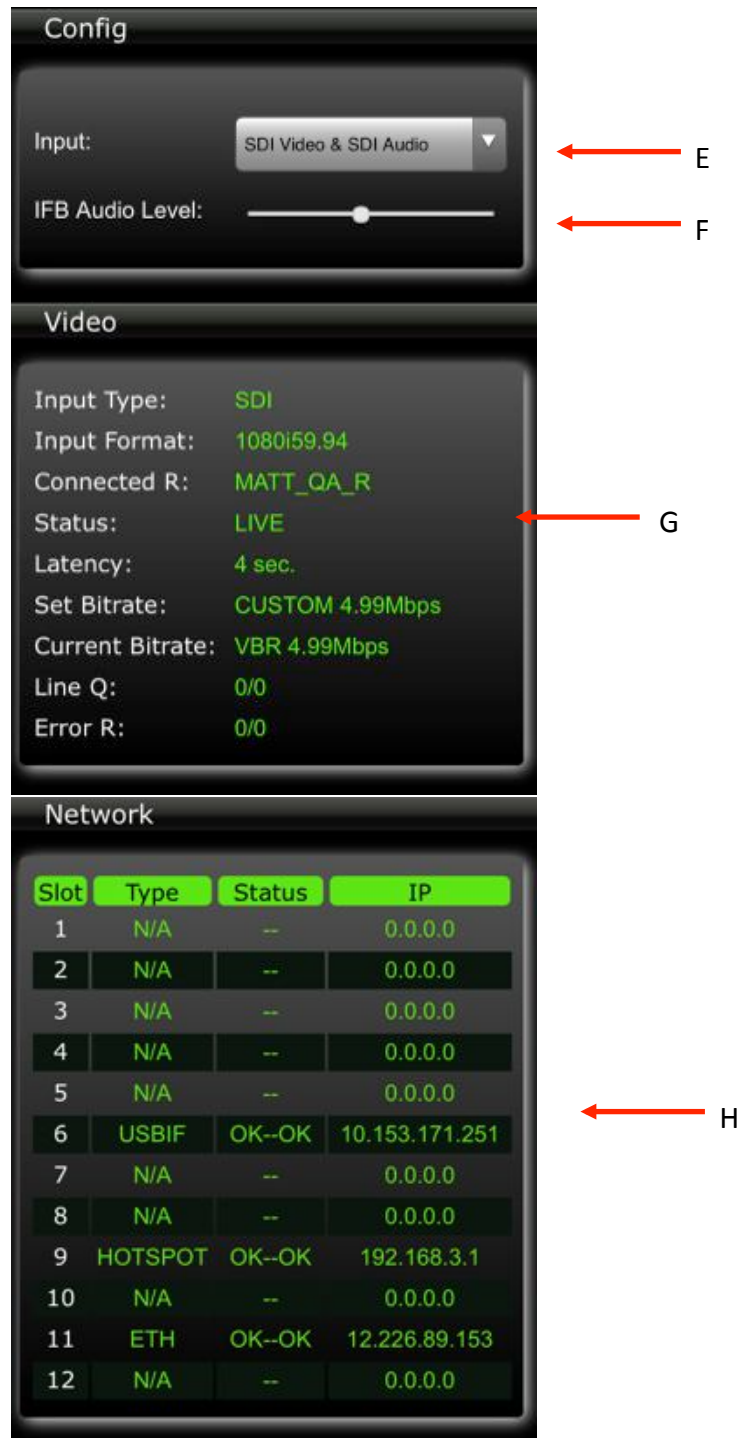
Label	TVUPack Transmitter Status Screen Description
A	Scroll bar that allows users to monitor and control all aspects of a transmission including datacards, Ethernet, Wi-Fi, BGAN, Receiver, and return video feed.
B	Information regarding a particular TVUPack such as model number, version number, and PID.
C	**CPU**: Current CPU capacity and temperature
D	**Battery**: Main battery status

Label	TVUPack Transmitter Status Screen Description
E	**Input**: Input source
F	**IFB Audio Level:** Change the audio level of the IFB function
G	**Video**: Transmission information and status
H	**Network**: Modem card information including type, connectivity, and IP address all organized by slot number

Ethernet

The Ethernet screen provides configuration and set-up information.
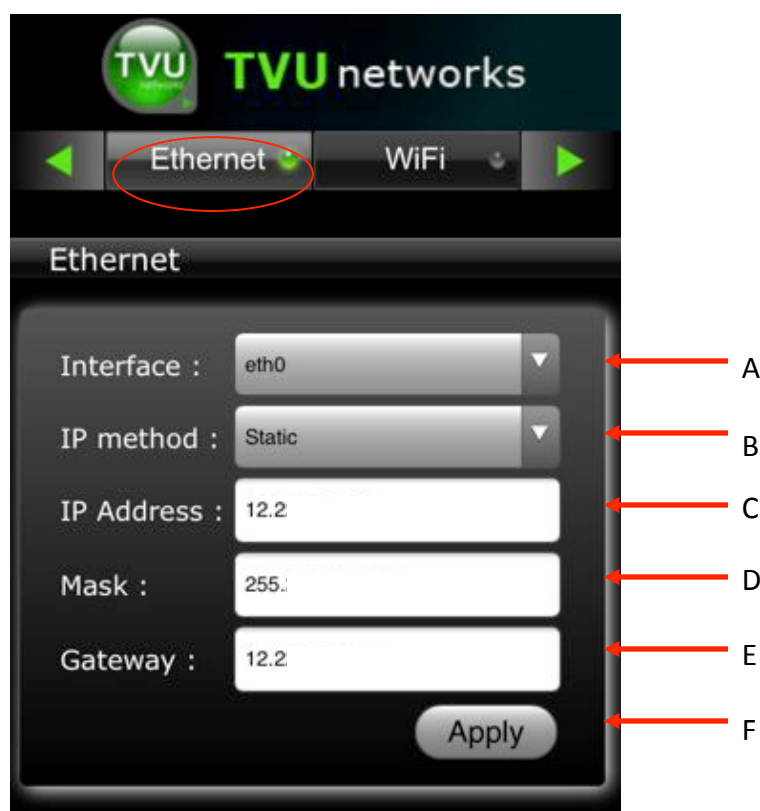
Label	TVUPack Transmitter Ethernet Status Screen Description
A	**Interface**: Select either Ethernet or USB from drop-down menu
B	**IP Method**: Select either Static or DHCP
C	**IP Address:** Entered manually if in Static mode; automatically generated if in DHCP mode
D	**Mask**: Entered manually if in Static mode; automatically generated if in DHCP mode
E	**Gateway**: Entered manually if in Static mode; automatically generated if in DHCP mode
F	**Apply**: Press Apply for the changes to take effect

WiFi

The WiFi screen provides configuration information and access to change the WiFi settings. The WiFi card should always be placed in port 9 on the TVU transmitter.
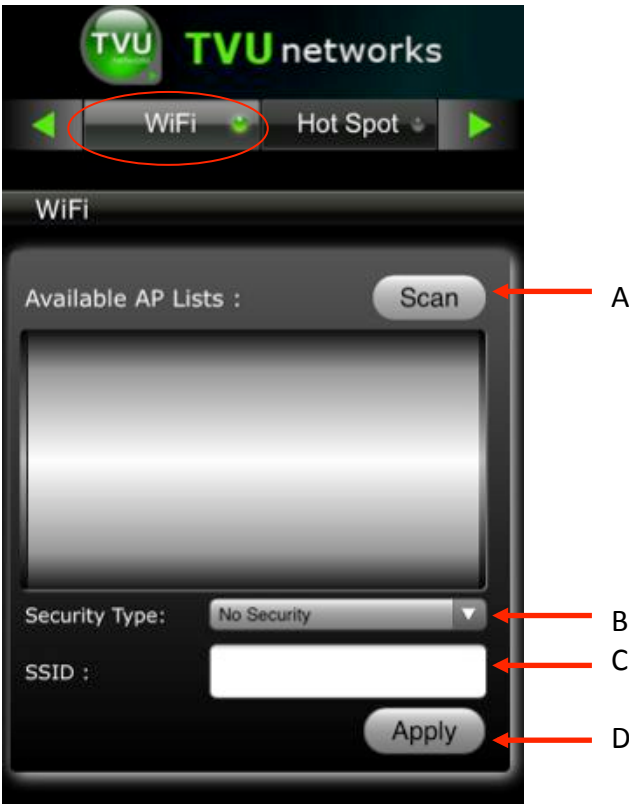
Label	TVUPack Transmitter Wi-Fi Status Screen Description
A	**Scan**: Scan for available networks and will display the list of available networks to select from the Available AP Lists box.
B	**Security Type:** Drop down menu displays the security type of the connection
C	**SSID**: Wireless network name
D	**Apply**: Press Apply for the changes to take effect

Hotspot

The Hotspot tab provides status information on clients connected via the Hotspot. The Hotspot card should always be placed in the USB port on the TVU Transmitter.
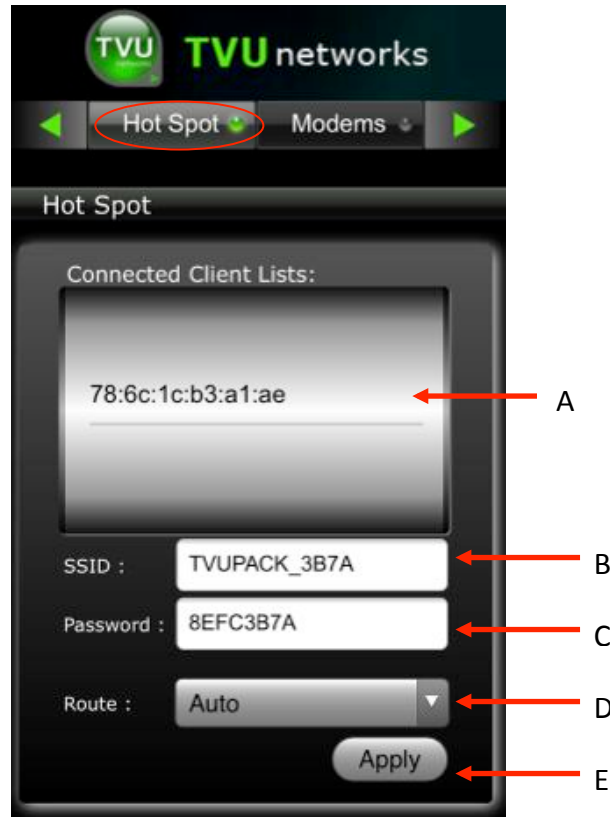
Label	TVUPack Transmitter Hot Spot Status Screen Description
A	**Connected Client Lists**: Displays list of devices connected via Hotspots
B	**SSID**: Allows you to customize the Hotspot SSID
C	**Password**: Allows you to customize Hotspot password (Note: the new password must be 8 characters and does not take affect until the system is rebooted).
D	**Route**: Choose a specific modem, WiFi network, or Ethernet connection, or choose Auto for the Hot Spot to be routed through a random modem connection.
E	**Apply**: Press Apply for the changes to take effect

Modem

The Modem screen provides modem configuration information. Many cellular data cards are automatically detected by the TVUPack and will self-configure. If this is the case, no further action will be required. If a data card needs to be configured, you can use this tab to configure specific data cards.
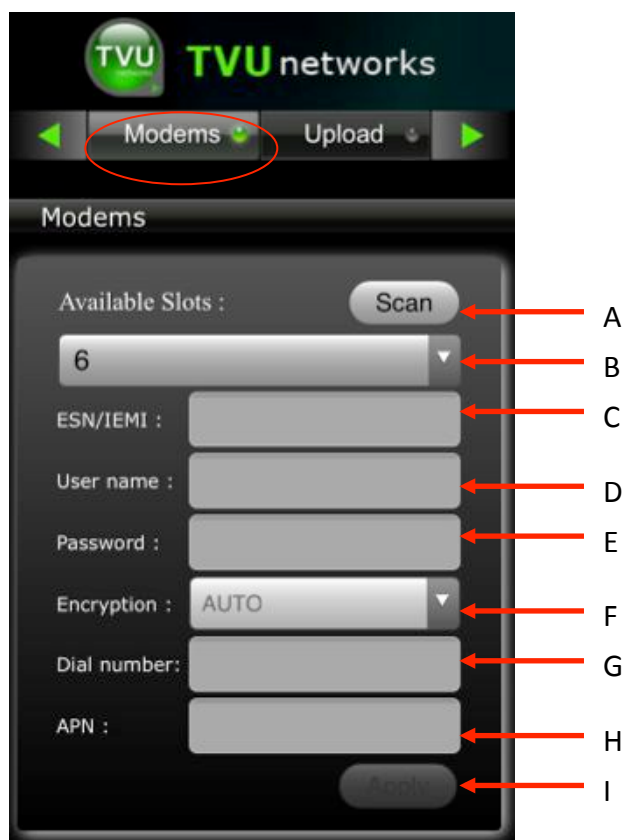
Label	TVUPack Transmitter Modem Status Screen Description
A	**Scan**: Search for available modems
B	**Available Slots:** Drop-down list of slots that are available for configuration.
C	**ESN/IEMI:** A modem's unique identification number
D	**Username:** Obtain carrier user name information from the network carrier
E	**Password:** Obtain carrier password information from the network carrier
F	**Encryption:** Select the appropriate encryption standard from the drop-down menu
G	**Dial number:** Obtain carrier dial information from the network carrier
H	**APN**: Obtain APN information from the network carrier
I	**Apply**: Press to apply desired changes

BGAN

The BGAN tab provides BGAN transmission information.

Label	TVUPack BGAN Status Screen Description
A	**Device Name:** Displays the device name
B	**Signal**: Displays the signal strength
C	**Linked**: Indicates if the BGAN is connected
D	**Link Type:** Indicates the BGAN link type
E	Drop down menu that allows for the selection of a specific streaming class

BGAN Configuration

The TVUPack TM5000 can support BGAN Hughes 9201 for automatic data connections. Follow these steps to set up the auto connection:

1. Set up the BGAN device to **Auto Register Network mode** by LaunchPad.

   A. To enable automatic registration, Select **Terminal > AutoStart mode**. The **Configure Auto-Start** screen is displayed:

B. Check **Automatically register with the network after BGAN terminal switches on** and then click **OK**. Then power off the BGAN device.

2. Connect the BGAN to the TM5000 by Ethernet cable.

3. Pointing to satellite by the Web UI of the Pack configuration from iPad or IE, for Hughes 9201, it has signal strength indicators on the panel.

   Note: You may need to manually adjust the equipment location and orientation in order to confirm the signal strength is greater than 60%

4. Set the link mode. "X-stream" is the default mode set up by the TVUPack automatically.

   Note: If the interface connected with the BGAN device is consistently yellow and does not change to green after setting up the "Link Type", please check whether the BGAN equipment - when connected to a PC - can work normally with LaunchPad's X-stream mode.

5. Check on the TVUPack's screen to make sure the BGAN is connected.

6. Power off the BGAN device to close the connections.

If the BGAN is the only device connected with the Receiver, then the Receiver will automatically change the biterate and CBR to 80% with four seconds of delay.

If there is no BGAN connected, the menu will display "No Device Detected" as shown below.

Receiver Status

It displays Line Quality and Error Rate information. Touch the Start/Stop Live button to control the live transmission. You use this screen to control Bit Rate and Delay by enter-ing your data in the respective boxes and touching the **Apply** button to set them. This screen also allows you to choose the operational mode provided in the drop down menu at the bottom of the screen: **Interview**, **Normal**, **Fast Moving, SD, and Tape Feed**.
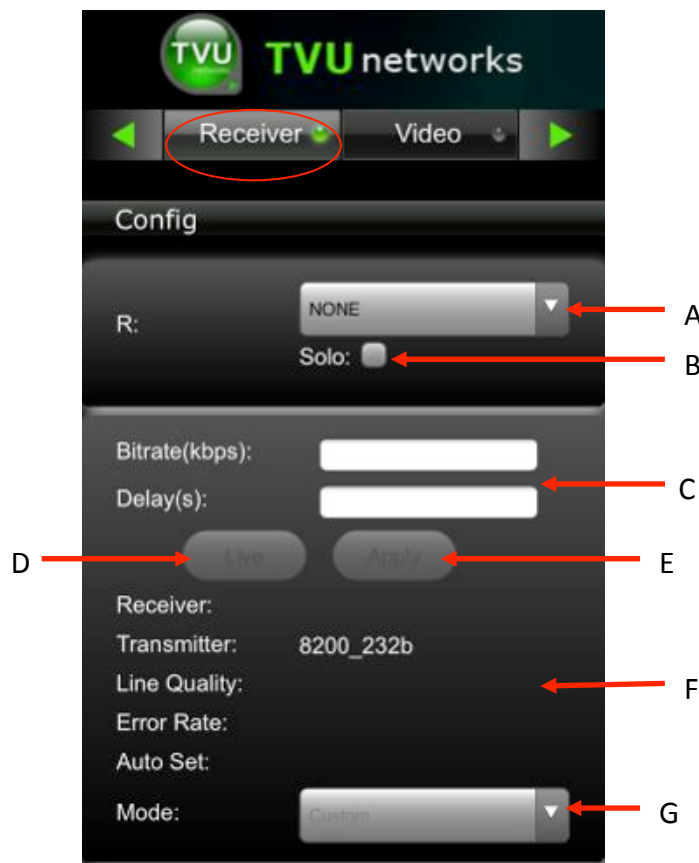
Label	Record Mode: Controls and Functions Description
A	**R:** Displays receiver name. To view a different available receiver, click the drop down menu to scroll through the options.
B	**Solo:** When checked, the particular TVUPack will only be shown as "online" on the

Label	Record Mode: Controls and Functions Description
	receiver selected from the drop down menu.
C	**Bitrate/Delay**: Enter the desired transmission Bitrate and delay(s).
D	**Live/Stop Live**: Starts and stops the live transmission.
E	**Apply**: Applies changes made to bitrate, latency, or mode.
F	Displays current TVUPack Receiver ID, TVUPack Transmitter ID, Line Quality, Error Rate and Auto Set.
G	**Mode**: Select an optimized preset bit-rate and latency based on broadcast setting(s) by choosing a different mode.

TVUPACK RECEIVER COMPONENTS

The TVUPack Receiver includes these standard components:

- Server
- Power Cable
- Faceplate
- Rails (x2)
- Cable Management Arm Kit
- IFB

Optional components for the TVU Pack Receiver include:

- Keyboard and Mouse
- Universal Adaptor

Note: If any component is missing, please contact TVU Networks Customer Support at support@tvupack.com or +1.650.440.4812.

TVUPack Transceiver Features and Indicators

TVUPack Transceiver Front Panel with Faceplate

Figure 24 - Front panel faceplate

Label	TVUPack Receiver Front Panel Faceplate
A	Power Button

Table 7 - Front Panel Faceplate

TVUPack Back Panel Connections (Standard SDI version)
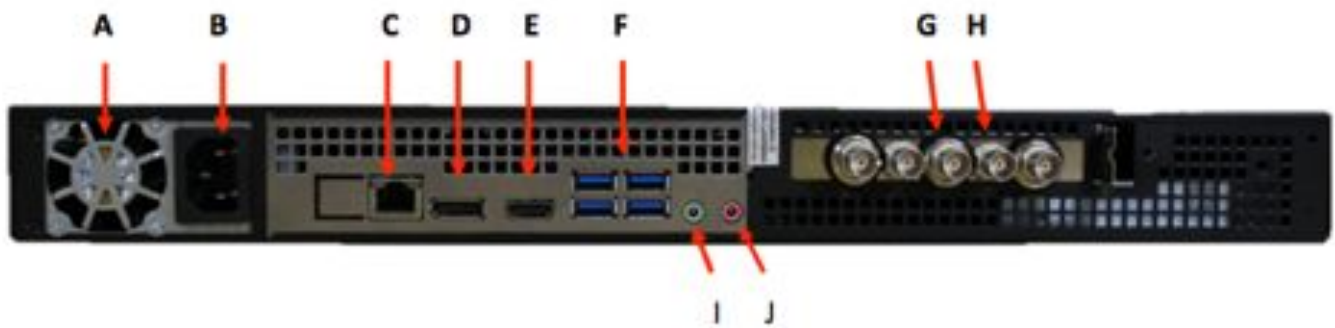
Figure 25 - Standard SDI back panel

Label	TVUPack Transceiver Back Panel Connections (SDI)
A	Vent; Do not block
B	AC Power
C	1 GigE Ethernet Port
D	Display Port: Connect the supplied Display Port to VGA adapter (see image below)
E	HDMI Display Port
F	USB Ports
G	SDI Output
H	SDI Input
I	Audio Output
J	Audio Input

VGA Adapter

TVU Receiver: Network and Firewall Configuration

TVU Networks recommends assigning a static IP address to the TVUPack receiver to ensure the network configuration remains stable. All the incoming ports referred to in this section are configurable. Please contact TVU Networks Customer Support if you wish to use a configuration other than the one specified in this documentation.

Please configure your firewall or router as follows:

1. Allow TCP outgoing from the TVU receiver on port 3970.

2. Allow UDP/TCP outgoing from the TVU receiver on port 123.

3. Permit all TCP/UDP incoming traffic for port 8088 to receiver.

4. Forward all traffic arriving on port 8088 of the external firewall interface to the IP address of the TVU Receiver.

This setup allows the TVUPack and receiver to automatically link with each other and permit video transport.

Recommended firewall configuration for TeamViewer
TVU Networks uses TeamViewer software to enable remote support and troubleshooting. To enable this software, please ensure that either port 80(TCP) or port 5938(TCP) are open for outbound connections.

Recommended firewall configuration for remote control of TVUPack receiver from iPod or smartphone
The TVUPack hotspot feature allows remote configuration of the TVUPack receiver settings from a smartphone. To enable this feature, permit all TCP/UDP incoming traffic for port 8288 to receiving terminal; forward all traffic arriving on port 8288 of the external firewall interface to the IP address of the TVU Receiver. This port is configurable.

Recommended firewall configuration for the FTP server
This feature allows files to be uploaded to the FTP server in the Receiver. To enable this feature, permit all TCP/UDP incoming traffic for port 21 to the receiving terminal; forward all traffic arriving on port 21 of the external firewall interface to the IP address of the TVU Receiver. This port is configurable.

Recommended firewall configuration for remote configuration of a TVUPack from the receiver
A TVUPack and its modems can now be configured from a remote location. To enable this feature, permit all TCP/UDP incoming traffic for port 22 to the receiving terminal; forward all traffic arriving on port 22 of the external firewall interface to the IP address of the TVU Receiver. This port is configurable.

Recommended firewall configuration for the Return Video Feed
This is a feature that can only be used on a TX3200 or GX3200 series Transceiver. It will allow camera operator in the field have the ability to watch a return video feed from the studio of their Pack transmission or from an SDI input at the Transceiver. To enable this feature, please ensure that you permit all TCP/UDP incoming traffic for port 8488. This port is configurable.

In order to view a TVUPack feed remotely, ensure that port 10003 is open for all inbound traffic.

To view an SDI feed remotely, make sure that port 10004 is open for all inbound traffic.

Note: these are default ports, configurable if required.

For more details, please contact TVU support by phone at +1.650.440.4812, by email at support@tvupack.com, or by skype at skype.tvupack

Operating the TVUPack Receiver

When used with the TVU Pack Mini SE, the TVUPack Receiver has 2 relevant operating modes: basic and advanced. The Record tab is not used. You can pair multiple TVUPacks to a receiver, but can only receive video from one at a time. There can be up an unlimited number of TVUPacks paired with your Receiver.

For owners of the TVUPack Mini HD version, please contact TVU Customer Support at +1.650.440.4812 for instructions on setting up the pack for HD mode.

Live Mode

Live Mode: Controls and Functions

Label	Live Mode: Controls and Functions Description
A	**System Information:** Displays Receiver Name, PID (unique identifier for TVU Receiver), Build Version, Build Date and Record Time Remaining (if the optional Receiver record option is select).
B	**Status panel:** Displays error rate, line quality, and battery status**.** *See Figure 1A*
C	**Transceiver Information:** Displays the input type and format, the output type and format, and IFB status. *See Figure 1A & 1B*
D	**Refresh button:** Resets the video stream. *See Figure 1A*
E	**Stop buttons (x2):** Clicking on either Stop button ends the live transmission.
F	**Audio level light display**: The two light displays provide visual monitoring of your audio levels. This displays dBFS audio input level at the Receiver.
G	**Mode selection button and mode indicator lights:** Use this button to toggle through the receiver operational modes. *See Mode Selection (page 31) for more information*
H	**Operational mode selection buttons:** Use the operational mode buttons to choose an appropriate capture quality. Each mode has a default bit rate and delay. *See Figure 2*
I	**Bitrate and delay controls:** Sliding bars allow you to manually set the target bit rate and delay levels. *See Figure 2*
J	**Datacard monitor panel:** This monitor panel displays the current status of each data

Label	Live Mode: Controls and Functions Description
	card. *See Figure 3*
K	**Monitor Histogram:** Displays throughput and IP address on each modem (mb/s).
L	**Connection mode and Connection strength indication:** The connection mode is displayed when available in the dark gray box between the carrier name as well as the connection strength. *See Connection Mode and Connection Strength (page 33) for more information*
M	**Reset**: Provides a full power reset for a particular modem. Use this feature when the modem is no longer able to connect or is having problems. On the TM8100, pressing "RESET" will force the modem to reconnect. *See **F** on Figure 3*
N	**Scale:** This drop down menu allows you to set the scale for the histogram graph. Once the scale has been changed, it will affect all of the histogram graphs displayed. Available selections are 1.2Mb/s, 2.4 Mb/s, 6Mb/s, and 12 Mb/s.
O	**Thumbnail of current video feed from TVUPack:** The left-hand column of the TVUPack monitor features an icon of the current feed. If a transmitter is live, a red box will appear around the thumbnail image.
P	**GPS information:** If a TVUPack transmitter is used with modems that support GPS, a display of the transmitter's location can be retrieved. *See GPS Locator (page 33) for more information*
Q	**IFB Indicator:** The IFB indicator is displayed below the transmitter's thumbnail picture. *See page 34*
R	**Stop buttons (x2):** Clicking on either Stop button stops the live transmission.

Status Panel

Arranged vertically on the right hand side of the receiver panel are a number of indicators designed to help an operator make quality and troubleshooting decisions. The status of the transmitter's batteries **(A)**(Figure 1A) is also displayed. See troubleshooting section for more information on interpreting these numbers.

Transceiver Information

Displays input type and input format of the transmitter, which are displayed as T Input and T Format respectively **(B)** (Figure 1A). The output type and output format of the transmitter are shown as R Output and R Format. Lastly, the IFB status is displayed **(C).**

As an added feature, the transceiver output settings can be chosen from the drop down menu in this section **(D)**(Figure 1B)**.** When "Match Input" is selected, the output format of the Transceiver will match that of the input at the transmitter. When "Fixed Setting" is selected, R format will always be set to the default preset that has been configured for the system. Please contact support for inquiries about this feature.
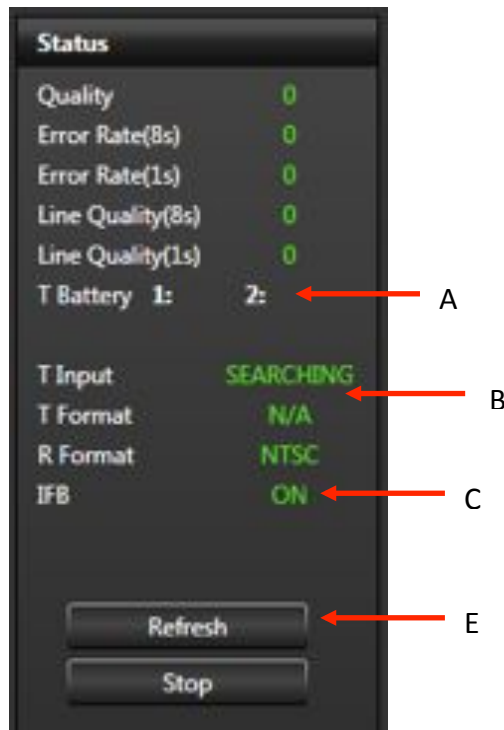
Figure 1A   **Figure 1B**

Refresh Button

If the video goes black or pixelates heavily and does not recover automatically within 15 seconds, click the Refresh button **(E)** (Figure 1A) to reset the video stream and reestablish the connection.

Mode Selection

The currently selected mode displays as a green-lighted tab. The modes that can be chosen are:

– **Live:** Live mode is the primary interface to be used during a Live transmission. When this tab is selected, the status of each of the datacard network connections is displayed under the "Monitor" section of the interface and the Bitrate, Delay, and Operational Mode buttons are displayed.

– **Record:** Record mode displays the store and forward interface for the preview, download, and management of Pack stored footage and files transferred via Auto Sync. Files transferred via FTP can also be accessed via this interface.

Operational Mode Selection

Depending on your news gathering environment, you can choose from the following preset bitrates and latencies (Figure 2):

• Interview: Bitrate 2048, delay 2 seconds.
• Normal: Bitrate 5120 delay 4 seconds.

- Fast Moving: Bitrate 5120, delay 8 seconds.
- SD: Bitrate 2048, delay 4 seconds.
- Tapefeed: Bitrate 20480, delay 10 seconds. This mode is optimized for content with multiple scene changes.
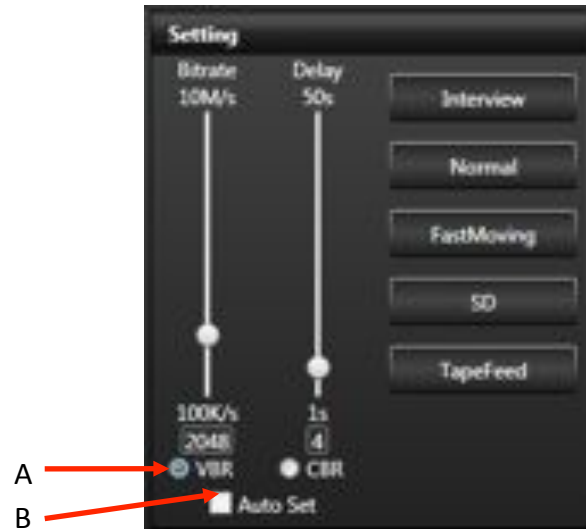

A ——→

B ——→

Figure 2

Bitrate and Delay Controls

In general, when manually setting bit rate and delay, it is recommended to adjust these values based on the available network conditions. "VBR" is the recommended encode mode under most conditions **(A)**(Figure 2). It is recommended that the desired delay is set first and the bit rate slider is moved until the error rate (8s and 1s) is set to zero. Note that the bit rate setting is a target for the system, but as network conditions vary, encode bit rate will automatically adjust accordingly (VBR encoding). If the desired picture quality cannot be achieved based on the network conditions, it may be necessary to increase delay.

Select the "Auto Set" check box once you have set the latency to automatically set the optimal bitrate **(B).** Once "Auto Set" is checked, the bit rate and delay sliders will be grayed out. When you press the LIVE button, a "checking bandwidth" symbol will display next to the checkbox. After a short time, the system will go live. The "Auto Set" mode can be disabled at any time by deselecting the checkbox. The system will return to the previous bit-rate setting.

Note: doing this during a live transmission will interrupt the transmission.

Datacard Monitor Panel

The check boxes associated with each cards' status bar enables or disables a particular datacard **(A)**(Figure 3). If unchecked, it will not be used to pass data. If checked on (default), it will be used. Individual read out panels show the carrier name (when available) of each active card **(B).** The slot number of each datacard is indicated in front of the car-

rier name **(C).** To retrieve the IP Address of a particular datacard, mouse over the name of that datacard. If no name is automatically provided and is displayed as <name>, you can input your own name. However, this will reset upon reboot. The color indicators displayed within the carrier name panel indicates the following status:

- **Red**:   Not connected
- **Green**:   Connected
- **Yellow:**   Dialing/Connecting
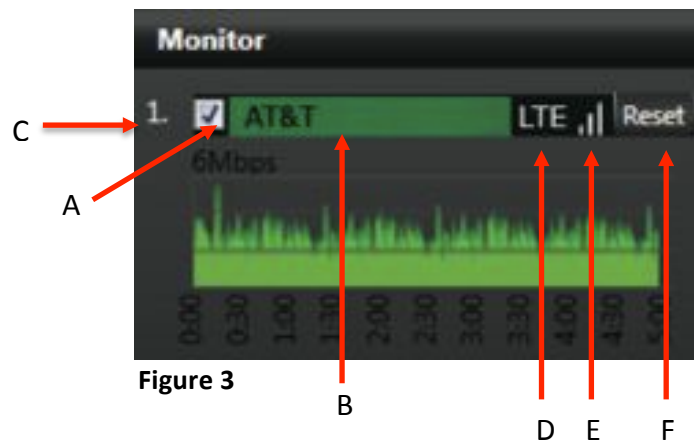- **Gray**: Disconnected or unplugged

Figure 3

Connection Mode and Connection Strength Indicator
The connection mode **(D)** is next to the connection strength, which is indicated with three status bars **(E)**(Figure 3). If the bars are all gray, there is no connection. Three green bars indicate excellent connection strength.

GPS Locator
When the transmitter is online, its name will be underlined underneath its thumbnail image. By clicking on the underlined name, the GPS data for that individual transmitter will appear. To locate all online transmitters at once, click "Locate All" at the top of the thumbnail column.

IFB Indicator

The five-color indicators are as follows:

- **Red**: IFB function is in use
- **Red-Gray**: Either the transmitter has gone offline and the IFB will recover when it is back online or the transmitter goes live with a different receiver while you were speaking with the Pack via the IFB function
- **Green**: IFB function is connected but not in use
- **Green-Gray**: Either when the transmitter is live with another receiver or when the transmitter is using the IFB function to speak with another receiver
- **Gray:** IFB Function not available for this transmitter

To use the IFB function, click the IFB indicator so that it turns red. The IFB on/off status is also indicated in the "Status" panel on the left side of the interface. Additionally, if a particular TVUPack has an IFB function, the IFB is automatically turned on when that transmitter goes live. Once the live transmission is stopped, the IFB function will be turned off.

Configuring Modem Cards from the Receiver Interface

The modems can be configured on the TVUPack Receiver Interface by taking the following steps:

1) Right click the histogram of the modem you would like to configure

Figure 4

2) A pop-up window will appear with the dial number, APN, and other necessary information

Figure 5

3) Hit "Apply" and the modem will be configured

Record / Viewing Mode

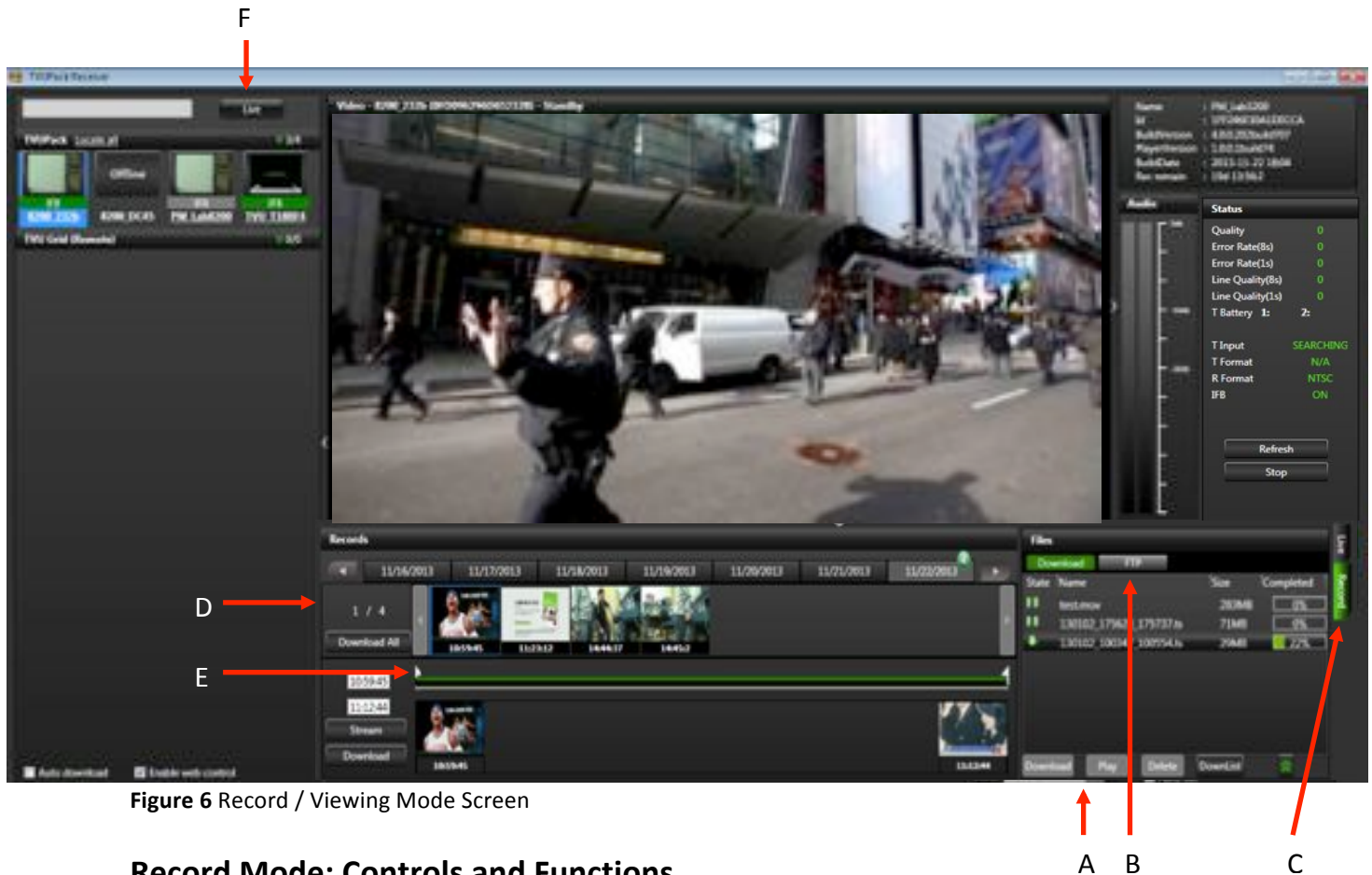Record mode allows you to preview, download, and delete stored footage.

Figure 6 Record / Viewing Mode Screen

Record Mode: Controls and Functions

Please refer to **Live Mode: Controls and Functions** for a complete description and explanation.

Label	Record Mode: Controls and Functions Description
A	**Download tab - Files monitor panel:** The Download tab shows the status, name, size, and completion percentage of all your downloaded files. Use the four buttons at the bottom of this panel to manage these files: • Stop • Play • Delete • Download
B	**FTP tab**: It is possible to upload video clips from an FTP to the TVUPack Receiver. The files uploaded to the FTP in the receiver will be displayed in this tab. Any type of file can be uploaded to the FTP server and most of the media files can be played back in the FTP tab and output to SDI. For further instructions, see *Uploading Media Content to the Receiver Using the FTP* (p. 42)
C	**Operations mode tab:** This tab displays the current operation mode.
D	**Records control panel:** Each time a video source is switched on and off, the TVUPack

Label	Record Mode: Controls and Functions Description
	automatically creates a new recording on its internal SSD in a FIFO loop. This recording utilizes a completely different encoder than what is used for the Live transmission. This ensures that a high quality of version of any content (whether Live or not Live) is available. *See Records Control Panel (page 38) for more information*
E	**Edit bar:** Use the start and end time triangular cursors on the green edit bar to select the footage to download by time.
F	**Stop buttons (x2):** Clicking on either Stop button stops the preview of footage or the file download.

✎ Note: The recorded content will be recorded at the transmission quality when the TVUPack Mini is "Live". When the TVUPack Mini is in "Standby" mode and is connected to a video source, the recorded content will be recorded at the highest quality possible.

Records Control Panel

The "Records" panel displays the number of recordings for each date on the scroll bar at the top. The green-circled numbers **(A)** that appear next to the dates show how many separate recordings have been captured on that day (Figure 7). Thumbnails of each recording **(B)** will display below the date bar. Each thumbnail also shows the start time for the clip. When you highlight a thumbnail, its start and end times appear in the left-hand column below the "Download All" button. Use the green edit bar below the thumbnails to mark "in" and "out" **(C)** on the recordings for extraction.
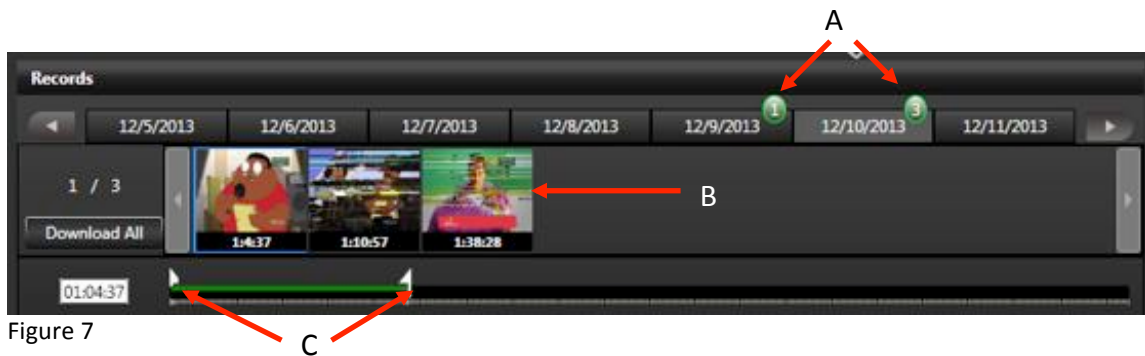

Figure 7

Viewing, Downloading, and Deleting Stored Data

The TVUPack records all video it receives into a first in, first out (FIFO) drive. The last six hours of SD video or 1.5 hours of HD video are available for download from the TVUPack transmitter. After the storage limit is exceeded, the Pack records over the older video.

If the TVUPack is currently in Live mode, begin by selecting **Stop** in the upper left corner. This will stop the live video feed and change the status to Preview. The thumbnail of the current feed will display a stopped camera icon, also indicating no transmission. The system is now ready for managing the stored data. Select the clip you would like to download by clicking on the thumbnail image. Then click "Download". The clip will begin to download in the status box to the right of the thumbnail images (See **A** on Figure 6).

If you need to go back into Live mode, the stored data that is being exported or down-loaded will be paused. The process of exporting or downloading will resume once Live mode is disabled again.

Exporting an entire Video Clip

Take the steps outlined below to export an entire video clip:

1. Click on the arrow **(A)** to open the File Export and Rename drop-down menu (Figure 8A & 8B).

2. Select the clip **(B)** to display in the task list **(C)** (Figure 8A and 9)

3. Click on the drop-down menu arrow and select the Export format **(E)** (Figure 9).

4. Rename the exported file in the Save As field **(F)**.

5. Click Export to start the file export process **(G)**.

6. Monitor the progress of the exported file **(D)**.

Figure 8A **Record Mode Controls and Functions Screen**

A

C

E

G

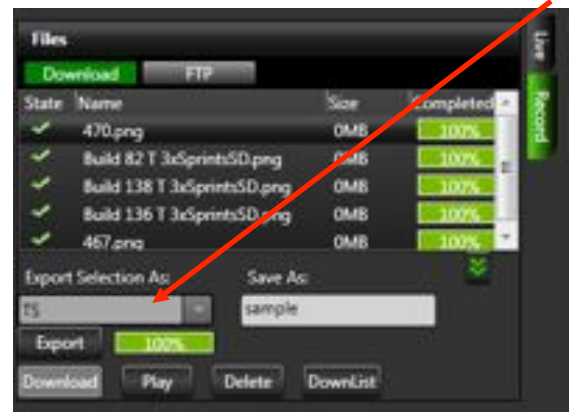Figure 9 **Record Mode Controls and Functions Screen**

D

F

Figure 8B

Take the following steps to select individual frames in a clip to export:

1. Navigate through stored data history by day or hour **(A)** (Figure 10).

2. Slide the start cursor **(B)** to the start of the time selected (Mark in).

3. Slide the end cursor **(C)** to the end of the time selected (Mark out).

4. Thumbnails of the in and out points will be generated by the system after a few moments.

5. Once the in and out points are selected, use the editing buttons (**D**) to download, play, delete, or stop the process.

6. Select the Export format **(E)** (Figure 11).

7. Re-name the exported file and click the Export button **(F)** to start exporting.

8. Select Export **(G)** to begin the process of preparing the video on the pack for transmission to the receiver.

9. When the file reaches 100%, **(H)** transfer to the Receiver hard drive is complete and ready to be played out.

10. The file can be found under location C:\TVUTransporterR\download\0x_____ where the last section is the unique PID of the TVUPack. On a receiver paired with multiple packs there may be up to 10 of these folders.
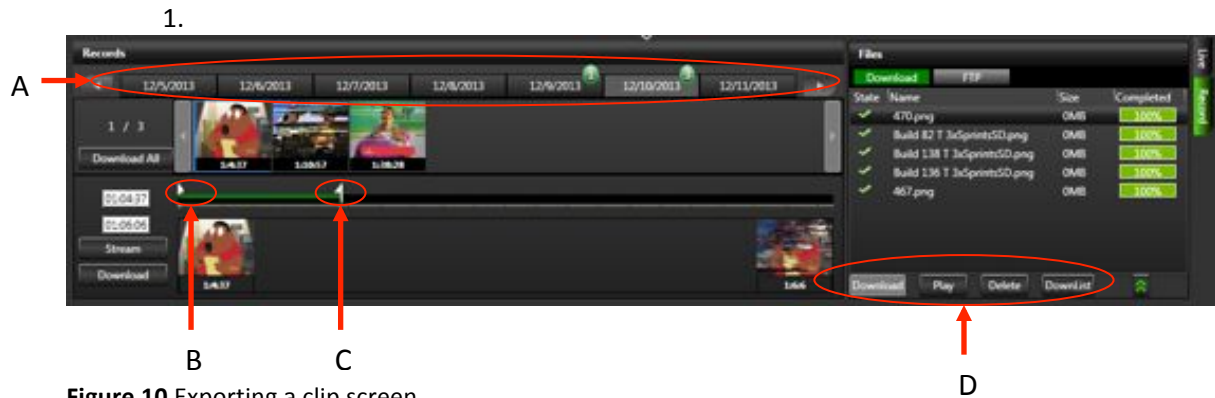
1.

Figure 10 Exporting a clip screen

Figure 11 Exporting a clip screen

Ingestion of Recorded Content Locally to USB Memory Stick

You can quickly and easily download the recorded content locally using a USB memory stick. To do so, simply place a USB memory stick into the spare USB port on the TVUPack Mini encoder unit. TVUPack Mini will auto-detect the memory stick.

Connect your smart device or laptop to the TVUPack Mini Hotspot (See page 18 for Connecting to Hotspot instructions). Select the "Recording" tab (Figure 12). Input the date (A) when the content was recorded and click "query" (B). The recorded content from the specific date will appear. Select the clip you would to download to the USB by checking the check box to the right of the clip file size (C). Once you have selected the clips you would like to export, click "copy" (D). The file will begin to download to the USB stick and a status bar will appear that will depict the transfer percentage (E).
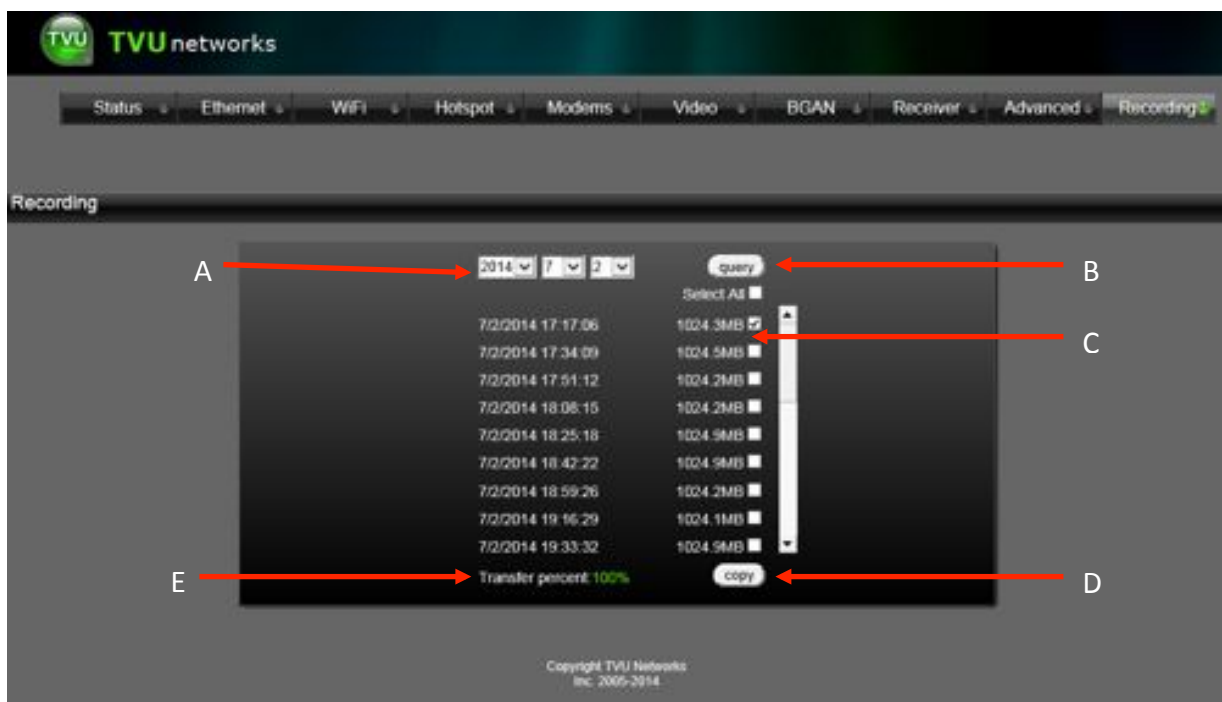

Figure 12

Deleting Uploaded Stored Content

Take the following steps to delete stored content:

1. On the TVUPack Receiver screen, select the Record tab (A) (Figure 13).

2. Select the file you would like to delete (B).
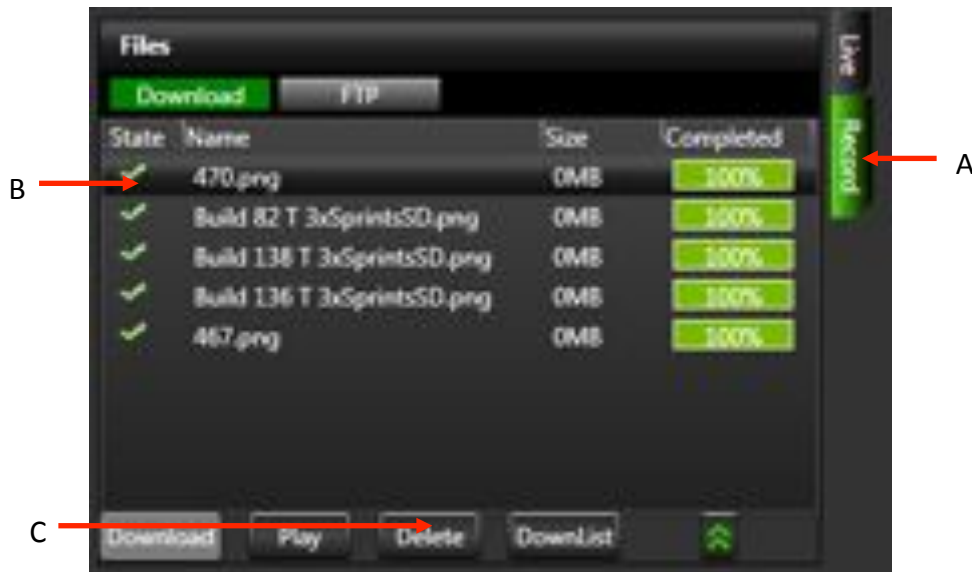
3. Click the Delete button (C).

Figure 13 Delete stored content screen

Uploading Media Content to the TVUPack Receiver Using the FTP

Take the following steps to upload media files from an FTP to the TVUPack Receiver

1. Log in to your usual FTP client

2. Retrieve the IP address of the TVUPack Receiver and plug it into the designated area on the FTP client

3. Type in the username and password of the TVUPack Receiver on the FTP. The username is the last four digits of the PID of the Receiver while the password is the last eight digits of the PID of the Receiver.

4. Drop the files you would like to upload into the FTP and they will be transferred to an FTP folder on the Local (C:) disk drive. These files will appear under the "Downloaded" tab on the TVUPack Receiver Interface.

Using the IFB Feature (Option)

The Interruptible Feedback (IFB) option allows your news operations center to speak directly to a TVUPack Mini SE in the field without the need for telephone contact. The IFB option includes a mixer/preamp. The mixer has a USB port for connecting to your receiver and an XLR port for plugging in a microphone. Setting up this option is as simple as "plug and play."
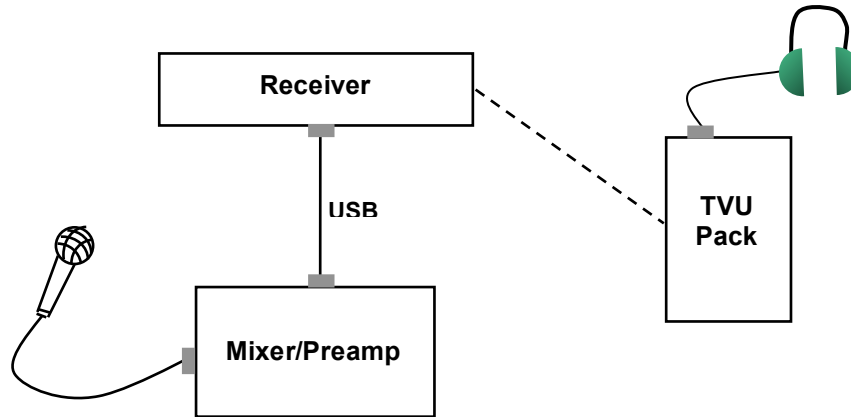
On the TVUPack Mini SE, connect a standard set of headphones to the 3.5mm audio jack on the body of the unit (located on the front panel). Once the connection between the pack and the receiver is in Live mode, audio will start to pass in real time.

CONTACTING TVU NETWORKS

At TVU networks, we value our customers and are committed to ensuring a high level of satisfaction. Should you ever need assistance with your TVUPack, please contact us at one of our numbers below:

Technical Support:
Phone: +1.650.440.4812
Email: support@tvupack.com
Skype: skype.tvupack

Billing Questions:
Phone: +1.650.969.6732

Corporate Address:
857 Maude Avenue
Mountain View, CA 94043

Product Specifications TVUPack Mini SE TM5100 Transmitter

Video Input	HD/SD-SDI (BNC or Sony 50-pin interface)
Video Resolutions	1080i, 720p, NTSC, PAL
Video Encoding	H.264
Audio Input	2 channel embedded SDI audio
Data Interface	Up to 4 USB modems plus Wi-Fi and Hot Spot
Supported Data Transmission	3G, 4G, Wi-Fi, WiMax, Ethernet (via USB)
Operating Temperature	0 to 40 C/32 to 104 F
Dimensions	4.9cm (D) x 11.2cm (W) x 18.4cm (H)
Weight	Less than 2lbs/1kg

Table 12 - TVUPack Mini SE TM5100 Transmitter product specs

- Specifications are subject to change without notice

	TR3100HD/3101HD	**TR3100SD/3101HD**
Electrical	Line Voltage: 100-240V AC, 50/60Hz 5.2 – 2.6A	Line Voltage: 100-240V AC, 50/60Hz 5.2 – 2.6A
Configuration	1RU, standard 19" rack mount (includes slide rails, for round or square-hole mount)	1RU, standard 19" rack mount (includes slide rails, for round or square-hole mount)
Audio / Video Output	BNC - SD/HD*-SDI (1080-50i/59.94i, 720-50p/59.94p, NTSC/PAL) w/ embedded audio (Optional analog output)	BNC - SD/HD*-SDI (1080-50i/59.94i, 720-50p/59.94p, NTSC/PAL) w/ embedded audio (Optional analog output)
Genlock	BNC - Tri-Level or BB	BNC - Tri-Level or BB
Display	DVI, VGA or HDMI	DVI, VGA or HDMI
IFB Input (optional)	External USB audio input with level control (mic/line), ¼" & XLR	External USB audio input with level control (mic/line), ¼" & XLR
Network I/O	2 independent 10/100/1000 BASE-T RJ45 Ethernet Interfaces, 2 x USB2.0,	2 independent 10/100/1000 BASE-T RJ45 Ethernet Interfaces, 2 x USB2.0,
Dimensions	~44x63x4.5cm (17.6"x25"x1.73") LxWxH	~44x63x4.5cm (17.6"x25"x1.73") LxWxH
Operating Environment	10 - 35°C (50 - 95°F), Humidity 20%	10 - 35°C (50 - 95°F), Humidity 20%

Table 13- TR3100HD/3101H and TR3100SD/3101HD specs

- **HD output on TR3100HD and TR3101HD models only**
- **Specifications are subject to change without notice**

APPENDIX A: TROUBLESHOOTING VIDEO QUALITY

Troubleshooting Video Quality Using the Status indicators in Normal and Advanced Modes:
The Status counters offer a visual indication of specific technical aspects of the current live session. By interpreting these numbers it is possible for an operator to troubleshoot and optimize the quality of a session.

Quality:
This is the real time effective bitrate of the transmission. If the system is set to VBR (variable bit rate) mode, this number will fluctuate between the configured maximum bitrate and the lowest bitrate the data connections can currently sustain. The maximum target bitrate is set by either using a preset mode in normal operation, or by using the bitrate slider in advanced mode.

If the system is set to CBR (constant bitrate) this number will remain constant.

Error rate indicators:
Error rate 8s. This indicates the percentage of uncorrected errors taken over an 8 second average. The aim is for this number to always remain at zero during transmission.

Error rate 1s. This indicates the uncorrected error rate over the last second. The aim is for this number to always remain at zero during transmission.

All uncorrected errors can contribute to undesirable video glitches. Any error rate greater than 0 indicates that the data connection is unable to operate cleanly in the current data environment. If attempting to operate in CBR (constant bitrate) mode try either lowering the required bitrate or switching to VBR to allow the system to adapt dynamically to conditions. If the system is already in VBR mode try increasing the delay to allow the error correction system more time to adapt to the network conditions.

Line quality indicators
Line quality shows the current error correction levels required for error free transmission at the configured settings.

Line Quality 8s: This is the level of error correction (as an average over the last 8 seconds) required to sustain clean transmission.

Line Quality 1s: This is the current level of error correction the system is using to sustain a clean transmission.

The TVUPack uses multiple methods of error correction to ensure smooth clean video transmission in very challenging environments. Since the underlying network conditions are always a factor when working over multiple connections simultaneously, some error

correction is always required. As a rule in difficult environments, the lower the latency, the more data is required for error correction to sustain a stable video transmission. This error correction, while highly effective, utilizes some of the limited bandwidth that is available in most situations. It is desirable where possible to limit the error correction required as it allows the system bandwidth for extra video quality.

Operational Example 1: TVUPack is being used in a poor data service environment. In this scenario the receiver is set to Normal VBR mode, but the pack is inside a building with poor data service. The Quality indicator is seen to fluctuate between 2048 and 1000 as the signal strength and available data service varies. This indicates that the pack is using TVU's Inverse Statmux to measure the available bandwidth and maximize throughput on a continuous basis. If the video quality is fluctuating, two approaches can be used at the receiver end to improve the video output consistency and stability.

Suggestions
- Try increasing the delay in 1s increments to allow the pack extra time to compensate for the dips in available bandwidth.
- Try incrementally reducing the maximum bitrate so the fluctuations between high and low are less noticeable.

Operational Example 2: TVUPack is being used in an environment with excellent data service.

In this scenario the receiver is set to Normal VBR mode and all data cards are performing well. The Quality indicator stays constant at 2048 and rarely fluctuates. Under these conditions it is possible that by switching to advanced mode and either increasing the bitrate (for improved video quality) or lowering the latency (for lower delay) may be practical. No action is required, but the system may be capable of enhanced performance if desired.

Suggestions
- Try increasing the bandwidth in 256k increments until the Quality indicator starts to become unstable and cannot sustain the new setting.
- Try decreasing the delay in 0.2 second increments until the Quality indicator becomes unstable and does not stay consistent at the maximum bitrate.

Operational Example 3: TVUPack is being used in an environment with average data service.

In this scenario the TVUPack is being used in an interview talkback situation. The desire is to minimize latency but the bandwidth available to the system is limited and the Quality indicator is fluctuating between 750 and 1800. Uncorrected errors are appearing in the video output.

Suggestions
- Try increasing the delay in 0.5 second increments until the uncorrected errors stop appearing.
- If delay is the most important factor, try decreasing the maximum bandwidth in 256k increments until the errors cease.

Operational Example 4:

In this scenario the receiver is set to Interview mode, but the pack is inside a building with poor data service. The line quality indicator increases up to approximately 50.00 but the Quality counter is down at 1000 and there are occasional errors. This indicates trouble on the underlying data networks.

Suggestion
- Try increasing the delay in increments of 0.5 seconds to allow the system time to compensate for poor conditions on the cellular network.